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Constant Mass and Changing Force

Isaac Newton described the relationship of the net force applied to an object and the acceleration it experiences by stating that the increase acceleration was directly proportional to its increase of force and inversely proportional to its mass. In this activity, a laboratory cart will be accelerated by a force and its acceleration will be measured using the SparkVue program

Please find a) set of masses, b) string 110 cm, c) ramp with pulley, d) ChromeBook e) small amount of tape

Procedure:

1) Set up your ramp as shown by the instructor (length of string should be about 110 cm). Measure the mass of the cart. Record the mass of the cart in the chart provided. Attach the sting to the cart and then place a hanger at the end of the string. Run it over the pulley. Pull the cart back to the point where the hanger is just under the pulley. Mark the starting point of the cart with tape placed onto the ramp. Make sure the string is level/parallel with the ramp and the pulley is adjusted to allow the string to be level.

2) Using the ChromeBook turn on the SparkVue program. Synch the cart to your ChromeBook. Set up a Velocity vs. time graph.

3) Attach a mass of 10 grams to the hanger and place the remaining amount in the cart (50 g).

4) Pull the cart back slowly and make sure the string, the cart and the weights are in a straight line. Next, have the cart drawn back to allow the mass on the string to be very close to the pulley.

5) Have your lab partner start the SparkVue program, then you release the cart. Protect the cart from hitting the pulley or falling off the ramp.

6) Once your first run is completed find the acceleration of the cart by referring to the velocity vs. time graph. Find the slope of the velocity curve using the slope tool in SparkVue. Record the acceleration in the chart provided.

7) Next, take from the cart 10 g of mass and attach it to the hanger at the end of the string.

8) Repeat step 3 again.

9) For the third and subsequent trials take 10 g of mass for each trial from the cart. Add the 10 g of mass to the hanger until all of the masses are off the cart. At the end, you should have 6 consecutive trials with increasing masses.

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Trial	Mass of system	Mass on cart	Mass on string	Applied force (mg)	Acc. From graph	Predicted acc. from F = m a
1	392g	40 g	10 g	0.098	0.25	0.25
2	392g	30 g	20 g	0.196	0.55	0.5
3	392g	20 g	30 g	0.294	0.871	0.75
4	392g	10 g	40 g	0.392	1.015	1.0
5	392g.	0 g	50 g	0.49	1.52	1.25

Analyzing the data:

1) Calculate the force masses exerted on the cart through the string. Enter it under the Applied force column.
   note-mass is not weight nor force. to find force or weight use m g.
   note-force or weight is measured in Newtons and not grams

2) From f = m a, find the predicted value for acceleration. Enter it into the chart.

3) Graph the applied force versus acceleration. After graphing, find a line with the best fit and find a formula for the line with the best fit.

4) What is the meaning of the slope of the applied force vs. acceleration?

5) Based on the graph, predict the new acceleration if we used a mass of 70 g.

6) Why does the graph not go through or reach point (0,0)?